

Herrera Environmental Consultants, Inc.

Memorandum

To Wanda Schulze, Seattle City Light
From Peter Jowise, Herrera Environmental Consultants
Date October 7, 2008
Subject Georgetown Steam Plant Flume, Slip 4 Outfall Work Plan

Over the course of the last year, Seattle City Light has been developing plans to close the Georgetown Flume. This closure will include demolition of the existing structure, removal of contaminated sediment from within the flume, removal of contaminated soil from adjacent to the flume, and construction of a new drainage system. The plans include a narrative description of the work (Design Report), construction plans and specifications (Project Manual), and a focused Slip 4 Outfall Work Plan specifically addressing activities that impact Slip 4 of the Duwamish Waterway. The original Slip 4 Outfall Work Plan was submitted on February 1, 2008 based on the assumption that construction would continue from Spring through Fall of 2008, during the dry season. However, due to delays in finalizing the construction documents, work is now expected to begin in March 2009. This delay means that the project must incorporate increased capacity for storm water management. This updated Slip 4 Outfall Work Plan describes the changes required to address the management of increased rainfall.

The flume currently provides for storage and delivery of stormwater draining a 6 acre basin to Slip 4 through an unobstructed outfall. The flume is also inundated when tidally influenced water from Slip 4 enters the outfall pipe. The February 2008 Work Plan was developed based on the assumption that construction would begin with sealing the flume outfall to segregate it from the tidal effects of Slip 4. All storm water entering the flume would have to be collected and transferred to a water treatment facility prior to discharge to the sanitary sewer. While this was a feasible plan for summer construction, fall and winter rainfall amounts could overwhelm the treatment facility and pose problems complying with our discharge permit. This updated Work Plan alters the previous work sequence to allow the flume to remain functional as a storm water conveyance through much of the project, reducing demand on the water treatment facility and the sanitary sewer. Instead of initially sealing the flume outfall, we will install temporary dams in upper portions of the flume to contain stormwater while working incrementally from upstream to downstream, toward Slip 4. Tidewater will be allowed to enter the flume from the bottom, as it always has, but it will only be able to move upstream as far as the last temporary dam. Any stormwater entering the flume above the dam will be diverted to holding tanks and the treatment facility; any stormwater entering the flume below the dam will drain into Slip 4, unaffected by construction activities. Construction will progress behind the temporary dams until the outfall is sealed for work in the last two currently piped segments (the flume has been divided into six segments based on structural characteristics, as shown in Figure 1).

Project Description

Cleaning and replacement of the existing outfall structure will require eight major work tasks, which are described in detail below. Some of these tasks require work below the MHHW elevation of 8.22-feet. The work will take place during sufficiently low tides so that no actual in-water construction is required for any component of the work, minimizing potential direct impacts to fish (we allow placement of the silt curtain and deployment of the oil boom by boat to minimize sediment disturbance). All intertidal construction will be performed by heavy equipment on shore or by personnel standing on the exposed sediment while the tide is out. The Contractor will be responsible for scheduling work during the appropriate tide conditions; therefore, work may be performed on non-consecutive days and may occur during the night or on weekends. However, we anticipate that the work described below can be accomplished in about 3 weeks, or 15 working days. Given that the overall flume remediation and closure project is limited by contract to 120 working days, the Contractor will make the final decision as to the sequencing of this outfall work in relation to other portions of the project. The anticipated start date for field activities is March 2009.

Some best management practices (BMPs) are specified in the contract documents, while others will be left up to the Contractor. BMPs that are included in the contract documents include:

- Perimeter silt fencing, a silt boom, and an oil boom (see Task 2 below).
- Access path stabilization to prevent erosion during high tide events (see Task 2 below).
- Daily erosion control inspections and visual water quality inspections.
- Vactoring, direct-load excavation (no stockpiling), or a leak-proof spoils container to minimize spills of sediment.
- At the end of each work period, equipment will be moved to an elevation 8 feet above MHHW and the area to be inundated will be cleaned of all debris or contaminated material.
- Upgradient controls will be employed to prevent stormwater from entering the work area.
- Work will be sequenced so that a new splash pad (see Task 5 below) is installed as soon as the outfall is sealed (see Task 4 below).
- Containing, collecting and, if needed, treating all liquids and solids generated by the pipe cleaning operation (see Task 6 below); treated liquids will be discharged to the sanitary sewer under permit from King County.

- Use of clean fill materials for bank restoration and splash pad installation. Fill materials will include rock, sand, and gravel. Sand and gravel fill materials will be analyzed to confirm they have chemical concentrations below 1/2 of the Sediment Quality Standards for PCBs.
- Restoration of disturbed bank areas (see Task 8 below).
- Visual monitoring during pipe cleaning to confirm that turbidity plumes associated with construction do not escape in-water controls; implementation of corrective measures will be required if visible plumes are detected.

Task 1 – Upper Flume Stormwater Controls

This task involves constructing a series of temporary dams across the existing wooden open flume (Segment C) that will allow construction to begin before installing the outfall cap at Slip 4. Two of these locations are shown on contract drawings C102 and C104 and as a detail on C112, included with this memo. These temporary dams will be located such that any water and suspended sediment and soil from work upstream of the dam is captured and pumped to the onsite treatment facility. The dams will also prevent tidal inundation from the Duwamish River into the active work areas.

These dams will be constructed of a steel plate driven into the ground such that the steel extends 3 to 4 feet beyond the existing flume walls and floor, temporarily cutting off hydraulic connectivity. Sump pumps will be stationed directly upstream of the dams to pump water from the flume generated by pipe cleaning or that enters the flume from groundwater or precipitation. Work upstream of the temporary dam will include sediment and water removal, drainage pipe installation, and soil stabilization (see attached contract drawings C101-C105 for specific removal activities along the flume corridor). The Contractor will construct another temporary dam downstream and install similar BMPs in the new work area prior to removing the upstream dam.

This process will continue until the work has progressed towards the upstream end of the first large 72" corrugated metal pipe (CMP) section near East Marginal Way (Segment B). Prior to removal of any sediment in the CMP (Segments A and B), the outfall will be sealed. It is likely that the Contractor will start work in and around Slip 4 while working upstream of the temporary dams. Working concurrently at Slip 4 will not have any direct impact on the effectiveness of the temporary dams.

Task 2 – Site preparation at Slip 4 (some work below MHHW)

This task will involve installing Temporary Sedimentation and Erosion Control (TESC) measures and construction of an access route from E-Marginal Way South to the outfall structure. The Contractor will be required to submit and receive approval of a TESC plan before

beginning work. TESC measures include installing a silt boom attached to the existing piles (see plan sheets C109 and C110). The boom will extend above MHHW down to the sediment, acting as a barrier to fish entering the work area. The bottom of the boom will be weighted to provide containment of sediment movement throughout the water column into or out of the work area during construction activities. An oil boom will be deployed directly outside of the silt boom.

An equipment access ramp constructed on the bank down to the intertidal work area will require clearing of upland vegetation and excavating the slope back to create an 8-ft wide drivable surface. Quarry spalls overlying a geotextile will be used to stabilize the native soils, providing for suitable equipment access and a staging pad. Approximately 10 cubic yards of quarry spalls will be placed in a 250 sq ft area below the MHHW level; all work will be performed “in-the-dry”. Silt fence will be required along the top of bank in the work area and along each side of the construction access ramp. Coir waddles will be placed in areas where silt fencing cannot be installed to direct stormwater runoff away from exposed soils to contain sediment.. Spill kits will be staged in or adjacent to the work area. This task will require up to 3 working days.

Task 3 - Remove sediment from in front of outfall (all work below MHHW)

Sediment that has accumulated in front of the flume outfall will be removed using either a vactor truck or an excavator. The equipment will be operated from the equipment pad constructed in Task 2 (see plan sheet C110). Work will not be performed in the water at any time. Erosion control measures will be inspected to ensure that sediment does not leave the work area. If an excavator is used, the sediments will be direct-loaded into water-tight roll-off boxes and taken directly for rail transport to an EPA-approved landfill. Alternatively, a water-tight spoils skiff can be used to contain the spoils until they can be loaded into roll-off boxes. If a vactor truck is used, the vactor truck will collect sediment in its tank and, when full, transfer the material to a roll-off box. Some personnel may need to be standing on intertidal sediments to help direct the excavator or vactor operator; all work will be timed so that it is performed above the waterline. It is anticipated that 15 to 20 cubic yards of sediment will be removed until the existing rip rap splash pad is exposed or until an elevation of -2.0 feet is reached (the flume discharge pipe invert elevation is -1.95 feet). It is expected that Task 3 can be completed in 1 day.

Task 4 – Prepare outfall face and install temporary plate (all work below MHHW)

Once the entire outfall is exposed in Task 3, workers will enter the intertidal work area to remove the existing grating, clean the face of the concrete outfall structure, and attach a steel plate to seal the outfall during cleaning (see plan sheet C108). As with Task 3, work will not be performed in the water at any time. Once the existing grating is removed, some sediment from immediately inside the outfall may need to be removed by hand in order to install the steel plate. This sediment may be placed into drums or directly into the excavator bucket, and will be mechanically lifted out of the work area. A temporary working surface consisting of a geotextile will be placed on the sediment at the end of the outfall to limit further disturbance. The concrete face of the outfall structure will be pressure washed and inspected. Concrete patching may be required in order to ensure a tight seal between the outfall plate and the concrete outfall surface.

Anchor bolts for the steel plate will be drilled in and anchored using a water-setting epoxy. A closed-cell neoprene gasket will be installed between the plate and the concrete to ensure a tight seal; a prefabricated steel plate will then be bolted onto the concrete face. This permanent plate will have a pre-cut hole to accommodate the new outfall pipe and will be fitted with a smaller, removable plate positioned over the pre-cut hole that will be removed to accommodate the new pipe installation following sediment removal (Task 7). We anticipate Task 4 can be accomplished in 3 to 5 working days.

Task 5 – Install new splash pad (all work below MHHW)

The excavation in front of the outfall may expose subsurface sediments that have higher concentrations of PCBs than existing surface sediments. Accordingly, this area will be covered with clean imported material to create a new splash pad as soon as possible after the outfall pipe end is sealed. The new splash pad will cover the area excavated in front of the new outfall. The splash pad will consist of materials that can fulfill two functional design objectives: 1) withstand the scour from the stormwater outfall discharge; and 2) physically isolate underlying sediments and prevent their movement to the surface. Refer to plan sheet C111 for details on the proposed splash pad construction. The splash pad will isolate the underlying contaminated sediment until Slip 4 dredging and permanent capping occurs in the future. An estimated 5 CY of material will be placed in front of the outfall, covering an approximate 10 by 8 foot area. We anticipate that the splash pad can be installed in 1 to 2 days.

Task 6 – Clean lower pipe segment (no work below MHHW).

After the splash pad is in place, the Contractor can commence the removal of sediment from Segment A of the Flume. The in-place volume of sediment to be removed is estimated at 100 cubic yards. Two methods have been identified as potential means for removing the sediment from the lower segment: 1) large diameter pipe jetting and 2) hydromining with pumping.

1. **Large Diameter Pipe Jetting:** Large diameter pipe jetting requires specialized equipment to effectively remove materials from large pipes. A large jetting nozzle will be fed into the outfall at manhole M100 (see plan sheet C105). Pressurized water stream propels the nozzle down the pipe. As the nozzle progresses forward, the jets on the nozzle loosen accumulated material, which is forced back up to the manhole. Typically, jetting is completed from the downstream end of a gravity pipe in order to take advantage of the slope; however, the slope of the outfall pipe is so minor (1 percent) the jetting can be performed from the upgradient manhole. Vendors have been contacted regarding the cleaning of this pipe with available equipment to confirm this approach works. The jetting nozzle is pulled back and loosened material is conveyed upgradient into manhole M100 where a vactor can withdraw it to the surface. The jetting process is an iterative process that is repeated until the pipe has been cleaned of accumulated materials.

The equipment above ground consists of a large pumping system, water reservoir, sediment accumulation and dewatering tank, and solids disposal containers. The Contractor may reuse the filtered water from the dewatering tank as a means of reducing the overall amount of water required for jetting. The dewatered sediment will be disposed of with sediment removed from other sections of the flume. The water used for jetting will be treated onsite prior to discharge to the sanitary sewer, under permit from King County.

2. **Hydromining:** Hydromining consists of using high pressure jets to suspend sediment in a slurry. The slurry washes down gradient in the pipe, where it is extracted with a slurry-compatible pumping system. The Contractor will need to core a hole into the top of the outfall concrete large enough to insert a prefabricated attachment for a pump connection (this would be accomplished during Task 4). The attachment will be sealed and visually monitored to ensure slurry is not escaping from the outfall while pumping. Slurry will be pumped in to a series of dewatering tanks to allow solids to settle out and the water reused to the extent possible. Similar to pipe jetting, sediment will be dewatered and disposed with the sediment removed from other parts of the flume. Water will be treated prior to discharge to the sanitary sewer.

Both processes can effectively remove the material from the pipe. However, because the pipe is corrugated, minor residuals may remain. Minor sediment residual is acceptable, as it will be incorporated into the grout during installation of the new outfall pipe in Task 7. The grout will solidify and stabilize the residual sediments. A camera survey will be performed to determine when the pipe has been sufficiently cleaned. EPA will be involved in the determination as to whether the pipe has been sufficiently cleaned.

Task 7 – Installation of new outfall pipe (some work below MHHW)

The new outfall pipe will be 24-inch diameter high density polyethylene (HDPE). The pipe will be placed inside the existing corrugated metal pipe (CMP) using a process called sliplining. Sliplining entails pulling a smaller diameter pipe (carrier pipe) through an existing larger diameter pipe (casing). The HDPE pipe will be assembled on the surface using a process called extrusion welding. Pipe sections are essentially melted together to form a structurally watertight joint. In this manner, a very long watertight pipe can be constructed.

To prepare for pipe installation, the Contractor will excavate and remove a portion of manhole M100. The HDPE pipe is flexible to some degree; however, a 60-foot long by 5-foot wide “receiving pit” will be required in order to fit the pipe into the existing outfall without damage. Material removed will be stockpiled onsite, tested for contamination, and disposed of appropriately.

The smaller metal plate on the newly installed metal outfall plate will be removed. A steel cable will be fed from the downstream opening through the existing pipe and connected to the end of the new HDPE pipe. This cable will be used to pull the new HDPE pipe through the existing CMP. A winch attached to an excavator arm will be used to wind the cable through the opening at the downstream end. Spacers (fitted bracings that keep the carrier pipe positioned within the casing) will be placed on the HDPE pipe every 10 feet as it is slid into the existing outfall. Approximately 2 feet of the new pipe will be extended out of the 30-inch opening in the metal plate.

No work will be conducted in the water. If the Contractor requires more than one tide cycle to pull the HDPE pipe, the winching cable will be disconnected at the winch, and placed into the end of pipe opening. The temporary cover plate will be reattached to keep Slip 4 water out of the flume until the next work window, when the winching resumes.

Once the new outfall pipe is in place and is properly adjusted to the correct slope/elevations inside of the existing pipe with the spacers, the opening will be fitted with a custom collar around the HDPE pipe. A temporary cap will be placed on the new outfall pipe to prevent tide water from entering during construction. The upstream end at manhole M100 will have a temporary form set around the HDPE pipe with openings near the top to allow injection of grout. Concrete trucks will deliver the grout to a pumping system located at the surface near manhole M100 and grout will be pumped into the existing CMP annular space. The volume of grout will be calculated prior to filling; once the volume has been reached, the annular space is assumed completely filled. The Contractor will monitor the outfall end during filling and stop the operation if grout is observed escaping from the outfall (the water-tight collar should prevent this from happening). Cure time for the grout is temperature dependent. The Contractor will monitor curing by checking the temperature of the grout. Once the grout has cured per project specification requirements, the form at the upstream end can be removed to leave a concrete face. The Contractor will repair manhole M100 and backfill the excavation with clean imported structural fill.

The HDPE outfall extension will be equipped with a pinch-type (or duck-bill) tide valve after removing the temporary cover. The tide valve will be connected to the end of the HDPE pipe per manufacturer requirements. Once the valve is in place, the Contractor's work on the pipe portion of the outfall section is completed.

Task 8 – Bank restoration (some work below MHHW)

Quarry spalls used for the access ramp will be removed after operations at the outfall are completed. Some TESC measures will be removed and topsoil placed in disturbed areas. The upland part of the worksite will be hydroseeded. TESC measures left in place will consist of coir wattles, jute mats, or other biodegradable materials. Long term planting of this area will be completed using native plants following completion of Slip 4 Removal Action dredging. No irrigation system or follow-on monitoring by the Contractor is anticipated as part of the Georgetown flume project.

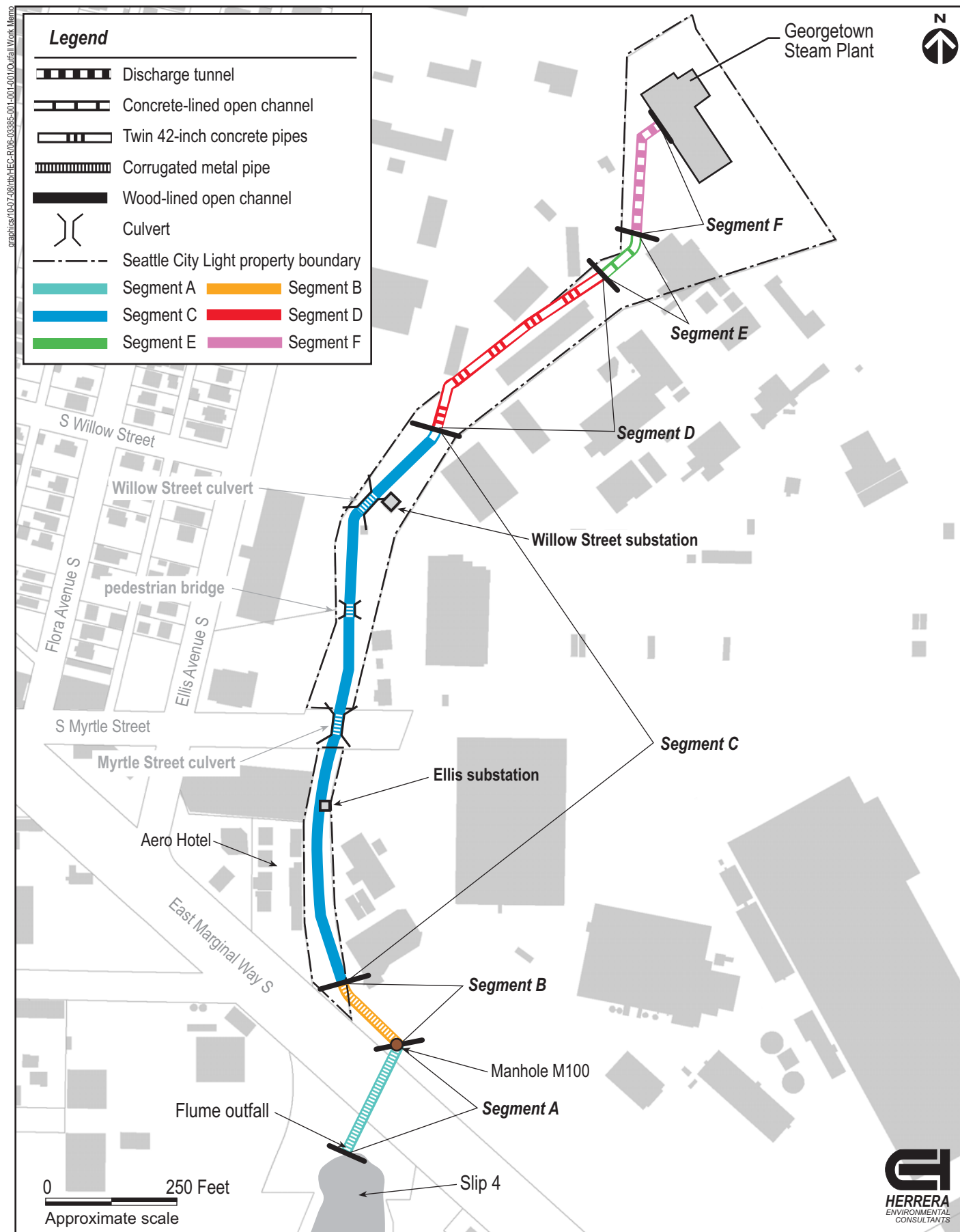


Figure 1. Site map, Georgetown flume, Seattle, Washington.